



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) EP 0 822 714 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:  
04.02.1998 Bulletin 1998/06

(51) Int Cl.<sup>6</sup>: H04N 5/445

(21) Application number: 97401804.6

(22) Date of filing: 28.07.1997

(84) Designated Contracting States:  
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC  
NL PT SE

(72) Inventors:  
• Ozkan, Mehmet Kemal  
92648 Boulogne Cedex (FR)  
• Ramaswamy, Kumar  
92648 Boulogne Cedex (FR)  
• Stewart, John Sidney  
92648 Boulogne Cedex (FR)

(30) Priority: 01.08.1996 US 24371 P  
18.03.1997 US 818592

(71) Applicant: THOMSON CONSUMER  
ELECTRONICS, INC.  
Indianapolis, IN 46206 (US)

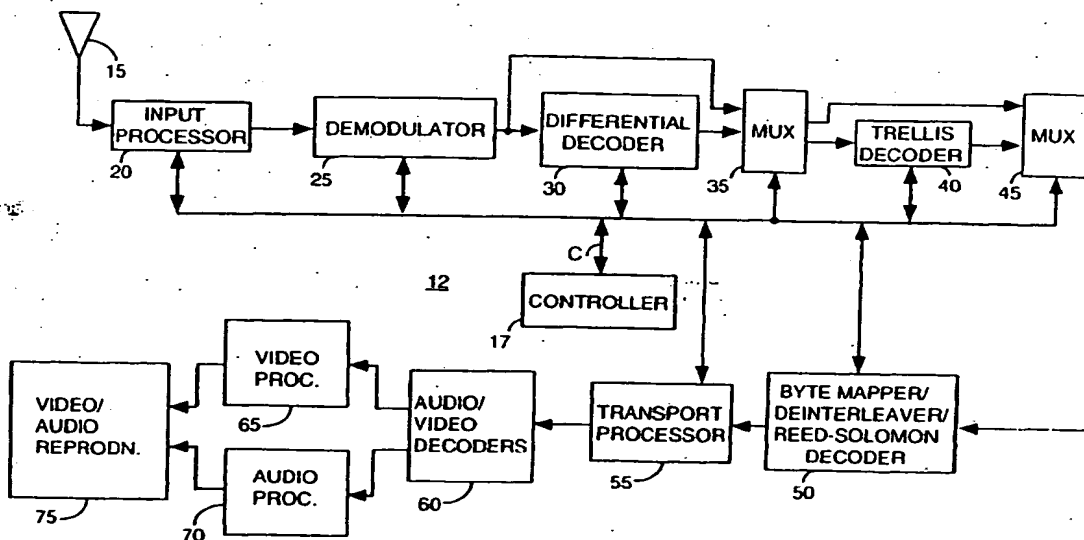
(74) Representative: Ruellan-Lemonnier, Brigitte  
THOMSON multimedia,  
46 quai A. Le Gallo  
92648 Boulogne Cédex (FR)

(54) A system for acquiring and processing video data and program guides transmitted in different coding formats

(57) A receiver system (12) automatically adaptively tunes (20) to broadcast signals that are variable in the number of channels that are transmitted, their signal coding type and their modulation format. A system receives a digital bitstream representing video information encoded in one of a plurality of different formats, and transmitted on one of a plurality of transmission channels. The system includes a processor

(17,55,20,25,30,50) for identifying and capturing program guide information including a plurality of channel maps. A channel map associates a transmission channel with a video channel output and the channel map is also associated with an encoding format. The system also includes an adaptive decoder (35,40,45) for decoding the bitstream to provide the video channel output in response to the program guide information.

FIGURE 1.



## Description

This invention is related to the field of digital signal processing, and more particularly to the acquisition and processing of video data and Program Guide Information derived from input data encoded in variable broadcast encoding formats.

### *Background of the Invention*

In video processing and storage applications, digital video data is typically encoded to conform to the requirements of a known standard. One such widely adopted standard is the MPEG2 (Moving Pictures Expert Group) image encoding standard, hereinafter referred to as the "MPEG standard". The MPEG standard is comprised of a system encoding section (ISO/IEC 13818-1, 10th June 1994) and a video encoding section (ISO/IEC 13818-2, 20th January 1995), hereinafter referred to as the "MPEG systems standard" and "MPEG video standard" respectively. Video data encoded to the MPEG standard is in the form of a packetized datastream which typically includes the data content of many program channels (e.g. content corresponding to cable television channels 1-125). In order for a decoder to decode the packetized datastream and to recover the video data content of selected program channels for display, for example, the individual packets that comprise the selected program channels must be identified and assembled.

In order to recover the content of selected program channels, information in a Program Guide is used in identifying and assembling individual data packets that constitute the selected programs. For this purpose Program Guide data is acquired from the program datastream that is input to a video decoder. The Program Guide data is formed into a Master Program Guide (MPG) sufficient to decode the selected programs. Once it is formed, the MPG may be used to decode the selected programs or it may be transmitted along with the data content of the selected programs to another application device. However, in some video transmission systems, it is necessary to acquire and form the MPG from Program Guide data encoded in variable broadcast encoding formats.

Variable broadcast encoding formats are used in wireless terrestrial video broadcast systems to selectively provide enhanced levels of broadcast signal noise immunity. However, a broadcast encoding format that provides enhanced noise immunity also requires increased transmission bandwidth. An example of a system that uses variable broadcast encoding formats is the proprietary Multipoint Microwave Distribution System (MMDS) which uses a "line-of-sight" transmission system. In such a system, an encoding format that provides a broadcast signal with a higher degree of immunity to noise also incurs a higher error correction coding overhead and consequently requires greater transmission bandwidth. Similarly, for a fixed transmission band-

width, providing a broadcast signal with a higher degree of noise immunity reduces the information throughput that may be attained. Further, the encoding format used may be varied on a temporal or geographical basis to accommodate variations in reception conditions associated with atmospheric or landscape features.

The variation in broadcast modulation and error correction coding format and the associated required transmission bandwidth presents problems to a video receiver both in decoding the variable encoding formats and in acquiring a compatible MPG. These problems are addressed by a system according to the present invention.

The use of variable broadcast encoding formats may result in a variation in the transmission bandwidth available for program data content. The inventors have hereby recognized that the number of program channels that are transmitted using variable broadcast encoding formats may be changed in conjunction with encoding format. Further, the number of program channels may be varied both over time, and with geographical broadcast area.

The inventors have further recognized that it is desirable for a receiver system to be capable of adaptively receiving variable broadcast encoding formats and a variable number of program channels. This allows the signal noise immunity of the broadcast system to be tailored to the requirements of a particular broadcast area. The receiver may be configured to provide higher broadcast signal noise immunity in a particular broadcast area where reception conditions are impaired due to hilly terrain, for example.

A disclosed receiver system automatically adaptively tunes to broadcast signals that are variable in: a) the number and the frequency allocation of the channels that are transmitted, b) the signal coding type e.g. trellis or non-trellis coded, and c) the modulation format e.g. formats using symbol constellations of 64 or 256 elements.

In accordance with the principles of the present invention, a system receives a digital bitstream representing video information encoded in one of a plurality of different formats, and transmitted on one of a plurality of transmission channels. The system includes a processor for identifying and capturing program guide information including a plurality of channel maps. A channel map associates a transmission channel with a video channel output, and the channel map is also associated with an encoding format. The system also includes an adaptive decoder for decoding the bitstream to provide the video channel output in response to the program guide information.

In a feature of the invention, the processor determines a transmission channel and broadcast encoding format associated with a desired video channel output from the program guide information and the adaptive decoder provides the desired video channel output in response to the determined format.

### Brief Description of the Drawings

In the drawing:

Figure 1 is a block diagram of apparatus, according to the principles of the invention, for demodulating and decoding signals of variable broadcast encoding format for display.

Figure 2 shows a flowchart for a process for tuning a Forward Error Correcting decoder system to a signal of variable broadcast encoding format.

Figure 3 shows a flowchart for a process for acquiring a Master Program Guide (MPG) from an input signal containing multiple Physical Transmission Channels (PTCs).

Figure 4 shows a flowchart for a process for providing selected video channel or program guide information for display from an input signal containing multiple Physical Transmission Channels (PTCs).

Figure 5 shows a flowchart for a process for forming program guide information and incorporating the program guide information in a video program datastream for transmission in variable broadcast encoding formats.

Figure 1 is a block diagram of a receiver system, according to the principles of the invention, for demodulating and decoding signals of variable broadcast encoding format for display. The receiver system automatically adaptively tunes to broadcast signals that are variable in: a) the number and the frequency allocation of the channels that are transmitted, b) the signal coding type e.g. trellis or non-trellis coded, and c) the modulation format e.g. formats using symbol constellations of 64 or 256 elements. Parameters indicative of coding type and modulation format are advantageously incorporated in Program Guide information within the transmitted signals in order to facilitate the receiving and decoding of the variable broadcast encoding formats.

The ability of the receiver system of Figure 1 to adaptively receive variable broadcast encoding formats allows the signal noise immunity of the broadcast system to be tailored to the requirements of a particular broadcast area. For example, the receiver may be configured to provide higher broadcast signal noise immunity in a particular broadcast area where reception conditions are impaired due to hilly terrain. In such a mode, the receiver may be configured for a less noise sensitive modulation format e.g. using 64 elements (in preference to 256 elements) and trellis coded data, for example. However, the enhanced noise immunity encoding requires greater signal bandwidth which results in less bandwidth being available for program data content and therefore fewer program channels may be transmitted. Consequently, the receiver of Figure 1 also adapts to variation in the number and the frequency allocation of the channels that are transmitted.

Although the disclosed system is described in the context of a system for receiving variable broadcast encoding format signals that are MPEG compatible, it is exemplary only. The principles of the invention may be

applied to systems in which the transmission channels may vary in number or in frequency allocation, or to systems in which the coding type or modulation format may be varied. Such systems may include, for example, non-MPEG compatible systems, involving other types of encoded datastreams and other methods of conveying Program Guide information. Further, although the disclosed system is described as processing broadcast programs, this is exemplary only. The term 'program' is used to represent any form of packetized data such as telephone messages, computer programs, internet data or other communications, for example.

In overview, in the video receiver system 12 of Figure 1, a carrier modulated with video data is received by antenna 15 and processed by unit 20. The resultant digital output signal is demodulated by demodulator 25. The demodulated output from unit 25, optionally differentially decoded by decoder 30, is provided to unit 50 via multiplexers (muxes) 35 and 45 following optional trellis decoding by trellis decoder 40. The optionally trellis decoded output from mux 45 is mapped into byte length data segments, deinterleaved and Reed-Solomon error corrected by unit 50. The corrected output data from unit 50 is processed by MPEG compatible transport processor 55 which separates data according to type based on an analysis of header information and provides synchronization and error indication information used in subsequent video data decompression. Compressed video and audio output data from processor 55 is decompressed by MPEG decoder 60 to provide audio and video output data to audio processor 70 and to video processor 65. Processors 65 and 70 format the audio and video signals to be suitable for reproduction by unit 75.

A video receiver user selects for viewing either a video channel or an on-screen menu, such as a program guide, by using a remote control unit (not shown to simplify drawing). System controller 17 uses the selection information, provided from the remote control unit, to appropriately configure the elements of Figure 1 to receive, demodulate and decode the input signal coding type, including differential or non-differential codes, trellis or non-trellis codes, and input signal modulation format, including 64 or 256 element symbol constellations. Elements 20, 25, 30, 40, 50 and 55 of Figure 1 are individually configured for the input signal type by setting control register values within these elements and by selecting signal paths via muxes 35 and 45 using a bi-directional data and control signal bus C. It is to be noted that the demodulator and decoder functions implemented by units 20, 25, 30, 40 and 50 are individually known and generally described, for example, in the reference text *Digital Communication*, Lee and Messerschmidt (Kluwer Academic Press, Boston, MA, USA, 1988).

Considering Figure 1 in detail, a carrier modulated with video data received by antenna 15, is converted to digital form and processed by input processor 20. Processor 20 includes radio frequency (RF) tuner and inter-

mediate frequency (IF) mixer and amplification stages for down-converting the input video signal to a lower frequency band suitable for further processing. In this exemplary system, the input signal received by the antenna contains 33 Physical Transmission Channels (PTCs 0-32). Each Physical Transmission Channel (PTC) is allocated a 6 MHz bandwidth and contains up to 6 video channels e.g. corresponding to cable TV channels 2-7.

It is assumed for exemplary purposes that a video receiver user selects a video channel (SC) for viewing using a remote control unit (not shown to simplify drawing). System controller 17 uses the selection information provided from the remote control unit to appropriately configure the elements of system 12 to receive the PTC corresponding to the selected video channel SC. Following down conversion, the output signal from unit 20 for the selected PTC has a bandwidth of 6 MHz and a center frequency in the range of 119-405 MHz.

Controller 17 configures the radio frequency (RF) tuner and intermediate frequency (IF) mixer and amplification stages of unit 20 to receive the selected PTC. The down-converted frequency output for the selected PTC is demodulated by unit 25. The primary functions of demodulator 25 are recovery and tracking of the carrier frequency, recovery of the transmitted data clock frequency, and recovery of the video data itself.

A carrier recovery loop in unit 25 processes the output from unit 20 to recover baseband video information. The data from unit 20 is a binary datastream representing a symbol sequence where each symbol is represented by assigned digital values. A set of symbols may be represented in a complex plane as a set of points called a symbol constellation, as known. The variable broadcast signal formats that are input to system 12 use Quadrature Amplitude Modulated (QAM) symbol constellations of either 64 or 256 points. The carrier recovery loop function in unit 25 compensates for symbol point offset and symbol point rotation caused by phase and frequency jitter in the carrier frequency introduced by the transmission channel and the instability of the oscillators in the low-noise-block (LNB) downconverter, as known.

The unit 25 carrier recovery loop derives a carrier offset value representing the symbol point rotation induced by the frequency error between the transmitted and derived carrier frequency of the selected PTC. The derived carrier offset value is used by the unit 25 carrier recovery loop to compensate for the symbol rotation induced by this frequency error. The carrier offset value in the exemplary embodiment does not significantly change between different PTCs. Consequently, once the carrier offset value is derived for one PTC it is stored by controller 17 and applied to the unit 25 carrier recovery loop to expedite the re-tuning of system 12 to other PTCs. The time required to retune system 12 to a different PTC is reduced by applying the stored carrier offset value to the unit 25 carrier recovery loop because the offset value accelerates recovery loop convergence.

In order to compensate for frequency drift and other variations affecting carrier loop convergence, controller 17 provides that the carrier offset value is periodically derived and updated. System 12 may alternatively be configured to derive a carrier offset value specific to each PTC for use in carrier recovery loop compensation.

The unit 25 demodulator also incorporates an equalizer function used in conjunction with the carrier recovery loop for the purpose of compensating for transmission channel perturbations and for reducing intersymbol interference, as known. In addition, a slicer in unit 25 applies a series of decision thresholds to the corrected output from the carrier recovery loop to recover the symbol sequence of the data that is input to demodulator 25. The slicer is configured by controller 17 for either a 64 point or 256 point QAM symbol constellation in response to the configuration Control signal C. The recovered video data output from unit 25 is provided to differential decoder 30.

Unit 25 also recovers sampling and synchronization clocks that correspond to transmitter clocks and are used for timing the operation of processor 20, demodulator 25 and differential decoder 30. The clocks are derived within unit 25 in accordance with known principles by deriving a phase and timing error signal based on a comparison of the slicer input and output data. The derived error signal is filtered and applied to the control input of a voltage controlled crystal oscillator to generate the clocks. Alternatively, a clock frequency greater than twice the symbol rate may be used as a sampling clock.

The output of demodulator 25 is optionally differentially decoded by unit 30 and passed to multiplexer 35. Differential encoding/decoding is a known technique used to overcome the problem associated with potential phase ambiguity in the derived carrier and recovered symbol constellation.

Controller 17 determines whether the input data is to be trellis decoded from parameters within the input data, or arbitrarily selects trellis decoding as part of an iterative initialization process. This initialization process is used for appropriately configuring system 12 to acquire and decode the received input data, as discussed later in connection with Figure 2. If controller 17 selects a trellis decoding mode, either differentially decoded data from decoder 30 or demodulated data from unit 25 is passed via mux 35 to trellis decoder 40. Decoder 40 applies known trellis decoding principles to detect code sequences in trellis encoded data from mux 35. Decoder 40 determines from the data symbols received from mux 35 the most likely corresponding sequence of bits that would have been trellis encoded by the encoder and thereby identifies the corresponding transmitted data symbols. The resulting recovered original data is provided via mux 45 to unit 50. However, if controller 17 selects a non-trellis decoding mode, either differentially decoded data from decoder 30 or demodulated data from unit 25 is provided to unit 50, via muxes 35 and 45, bypassing trellis decoder 40.

The output from mux 45 is mapped into byte length data segments, deinterleaved and Reed-Solomon error corrected according to known principles by unit 50. In addition, unit 50 provides a Forward Error Correction (FEC) validity or lock indication to controller 17. Reed-Solomon error correction is a known type of Forward Error Correction. The FEC lock indication signals that the Reed-Solomon error correction is synchronized to the data being corrected and is providing a valid output.

The corrected output data from unit 50 is processed by MPEG compatible transport processor 55. The individual packets that comprise either particular program channel content, or Program Guide information, are identified by their Packet Identifiers (PIDs). Processor 55 separates data according to type based on an analysis of Packet Identifiers (PIDs) contained within header information and provides synchronization and error indication information used in subsequent video data decompression.

Individual packets that comprise a selected program channel are identified and assembled using PIDs contained in a Master Program Guide (MPG). However, the PIDs identifying the MPG packets are predetermined and stored in internal memory of controller 17. Therefore, after controller 17 determines from the FEC lock indication provided by unit 50 that system 12 is producing valid data to transport processor 55, the MPG which is present on every PTC may be acquired without additional PID information. Using Control signal C, controller 17 configures transport processor 55 to select the data packets comprising the MPG. Processor 55 matches the PIDs of incoming packets provided by mux 45 with PID values pre-loaded in control registers within unit 55 by controller 17. Controller 17 acquires a full MPG by accessing and assembling the MPG packets that are identified and captured by processor 55.

The information in the MPG that enables controller 17, in conjunction with processor 55, to identify data packets that comprise individual programs, is termed a channel map. Further, the MPG advantageously contains channel map information that permits identification of packets comprising individual programs for all the PTCs and for the different broadcast encoding formats. Different channel mappings are associated with different broadcast encoding formats because the maximum number of available Physical Transmission Channels (PTCs) is determined by the available transmission bandwidth for a particular encoding format. As previously explained, the use of an encoding format that provides greater signal noise immunity results in less bandwidth being available for program content transmission. The channel mappings may also be varied to allow variation in transmitted program content between different broadcast areas or to allow change, i.e., addition or deletion of services, in normal broadcast operations.

Controller 17 uses the channel map information in the acquired MPG to identify the packets comprising the video channel SC that the User selected to view. Proc-

essor 55 matches the PIDs of incoming packets provided by mux 45 with PID values of video channel SC pre-loaded in control registers within unit 55 by controller 17. In this manner, processor 55 captures video channel SC packets and forms them into an MPEG compatible datastream containing compressed video and audio data representing the selected video channel SC program content.

The compressed video and audio output data from processor 55 is decompressed by MPEG decoder 60 to provide audio and video output data to audio processor 70 and to video processor 65. Processors 65 and 70 format the audio and video signals to be suitable for reproduction by unit 75. It is to be noted that the MPEG compatible datastream incorporating the MPG output by processor 55 may alternatively be provided to a storage device for storage (not shown to simplify drawing).

Controller 17 employs the process of Figure 2 for tuning and configuring processor 20, demodulator 25, differential decoder 30 and trellis decoder 40 to receive a signal of variable broadcast encoding format, as previously discussed in connection with Figure 1. The process of Figure 2 automatically adaptively tunes system 12 to receive signals that are variable in: a) the number and the frequency allocation of the channels that are transmitted, b) the signal coding type e.g. trellis or non-trellis coded, or differential or non-differential coded, and c) the modulation format e.g. modulation formats using symbol constellations of 64 or 256 elements. The process of Figure 2 is used when the FEC lock indication provided by unit 50 (Figure 1) signals that lock has not been achieved. Such a condition may occur at a first time power-up or following a broadcast encoding format change at the encoder, for example. In the exemplary process of Figure 2, the input data to system 12 is either, both differentially coded and trellis coded, or it is neither differentially coded nor trellis coded.

Following the start at step 100 of Figure 2, a carrier offset value is derived in step 105 in the manner previously described in connection with Figure 1. The carrier offset value is derived for an initial PTC e.g. PTC=0, and applied by controller 17 in step 105 to the unit 25 carrier recovery loop. In step 110, controller 17 is programmed to iteratively execute process steps 115-150 of Figure 2 for each PTC, beginning with the first PTC (PTC=0) until FEC lock to one of the PTCs has been achieved.

In step 115, controller 17 configures demodulator 25 for a 64 QAM modulation format symbol constellation and configures muxes 35 and 45 to provide the output from demodulator 25 to unit 50 bypassing decoder 30 and trellis decoder 40. If controller 17 determines in step 120 that FEC lock has not been achieved by unit 50, controller 17 performs step 125 to configure demodulator 25 for a 64 QAM modulation format. In addition, controller 17 in step 125, configures decoder 30 and decoder 40 to differentially decode and trellis decode the output data from demodulator 25 to provide differentially decoded and trellis decoded data to unit 50 via muxes

standard *Digital Television Standard for HDTV Transmission* of April 12 1995, prepared by the United States Advanced Television Systems Committee (ATSC). Alternatively, it may be formed in accordance with proprietary or custom requirements of a particular system.

In step 420, program guide information is formed incorporating the channel maps and modulation format and coding type parameters. The program guide information is incorporated into a selected video program datastream in step 425 to form a video output program. In step 430, the video output program data is further processed to be suitable for transmission to another device such as a receiver, video server, or storage device for recording on a storage medium, for example. The processes performed in step 430 includes known encoding functions such as data compression Reed-Solomon encoding, interleaving, scrambling, optional trellis encoding, differential encoding and modulation. The process is complete and terminates at step 435.

The architecture of Figure 1 is not exclusive. Other architectures may be derived in accordance with the principles of the invention to accomplish the same objectives. Further, the functions of the elements of system 12 of Figure 1 and the process steps of Figure 2-5 may be implemented in whole or in part within the programmed instructions of a microprocessor. In addition, the principles of the invention apply to any form of MPEG or non-MPEG compatible electronic program guide. Further, although the disclosed system receives variable broadcast QAM modulation formats and trellis or non-trellis coded data, it is exemplary only. The principles of the invention may be applied to systems that receives other types of signal coding, not just optional trellis coding and other modulation formats not just QAM including forms of Pulse Amplitude Modulation (PAM).

## Claims

1. In a system for receiving a digital bitstream representing video information encoded in one of a plurality of different formats, and transmitted on one of a plurality of transmission channels, apparatus comprising:

a processor (17,20,25,30,50,55) responsive to said bitstream for capturing program guide information including a plurality of channel maps, wherein a channel map associates a transmission channel with a video channel output and said channel map is associated with an encoding format; and

an adaptive decoder (35,40,45) for decoding said bitstream to provide said video channel output in response to said program guide information.

2. Apparatus according to claim 1, wherein

said program guide information is transmitted on a plurality of said transmission channels.

3. Apparatus according to claim 1, wherein said channel maps include a first channel map associating a first number of transmission channels with a first encoding format and a second channel map associating a different second number of transmission channels with a second encoding format.

4. Apparatus according to claim 4, wherein said first channel map transmission channels have a different frequency allocation compared to said second channel map transmission channels.

5. Apparatus according to claim 1, wherein said program guide information includes a parameter indicative of coding type; and said adaptive decoder is configured in response to said parameter.

6. Apparatus according to claim 1, wherein said program guide information includes a parameter indicative of modulation format; and said adaptive decoder is configured in response to said parameter.

7. Apparatus according to claim 1, wherein said adaptive decoder is configured with a first carrier offset value associated with a first transmission channel and a different second carrier offset value associated with a second transmission channel in response to said program guide information.

8. In a system for receiving a digital bitstream representing video information encoded in one of a plurality of different formats, and transmitted on one of a plurality of transmission channels, apparatus comprising:

a processor (17,20,25,30,50,55) for capturing program guide information to determine a transmission channel and broadcast encoding format associated with a desired video channel output; and

an adaptive decoder (35,40,45) for decoding said bitstream to provide said desired video channel output in response to said determined broadcast encoding format.

9. Apparatus according to claim 8, wherein said adaptive decoder is configured to decode said determined broadcast encoding format in response to a broadcast encoding format indicating parameter in said program guide information.

10. Apparatus according to claim 5 or claim 9, wherein said decoder is configured for trellis or non-trellis decoding in response to said indicator.
11. Apparatus according to claim 5 or claim 9, wherein said decoder is configured for error correction decoding in response to said indicator. 5
12. Apparatus according to claim 6 or claim 9, wherein said decoder is configured for decoding modulation format symbol constellation size in response to said indicator. 10
13. Apparatus according to claim 1 or claim 8, wherein said adaptive decoder is configured with a transmission channel dependent carrier offset value. 15
14. Apparatus according to claim 1 or claim 8, wherein said video channel output is selected from a plurality of video channel outputs transmitted on said transmission channel. 20
15. Apparatus according to claim 8, wherein said processor, 25  
tunes to receive said transmission channel encoding format; and  
captures data packets comprising said desired video channel output. 30
16. Apparatus according to claim 15, wherein said processor tunes to receive a coding type in response to said program guide information. 35
17. Apparatus according to claim 16, wherein said coding type includes trellis or non-trellis coding.
18. Apparatus according to claim 16, wherein said coding type includes error correction coding. 40
19. Apparatus according to claim 15, wherein said processor tunes to receive a modulation format in response to said program guide information. 45
20. Apparatus according to claim 19, wherein said processor tunes to receive a modulation format symbol constellation size in response to said program guide information. 50
21. Apparatus according to claim 15, wherein said processor identifies data packets comprising said desired video channel output using said program guide information. 55
22. Apparatus according to claim 15, wherein said processor selects said video channel output from a plurality of video channel outputs transmitted on said transmission channel.
23. Apparatus according to claim 15, wherein said processor determines said transmission channel from a channel map associating transmission channels with an encoding format.
24. Apparatus according to claim 15, wherein said processor configures a demodulator.
25. Apparatus according to claim 15, wherein said processor configures a decoder.
26. A method for decoding a digital bitstream representing video information encoded in one of a plurality of different formats, and transmitted on one of a plurality of transmission channels, comprising the steps of:  
identifying program guide information including a plurality of channel maps wherein  
a channel map associates a transmission channel with a video channel output and said channel map is associated with an encoding format;  
capturing said program guide information; and  
adaptively decoding said bitstream to provide said video channel output in response to said program guide information.
27. A method for decoding a digital bitstream representing video information encoded in one of a plurality of different formats, and transmitted on one of a plurality of transmission channels, comprising the steps of:  
capturing program guide information;  
determining a transmission channel and broadcast encoding format associated with a desired video channel output from said program guide information; and  
adaptively decoding said bitstream to provide said desired video channel output in response to said determined broadcast encoding format.

FIGURE 1.

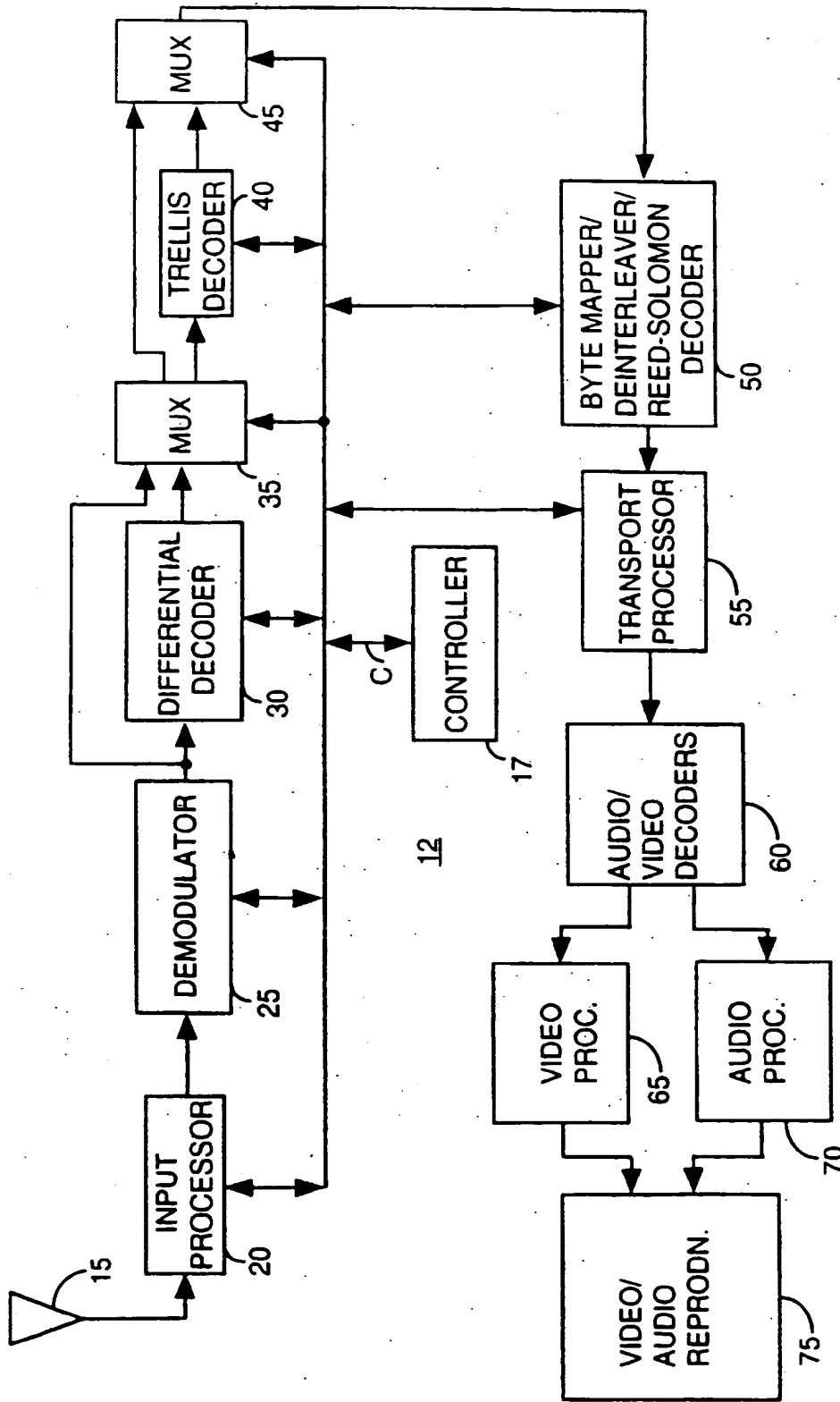




FIGURE 2

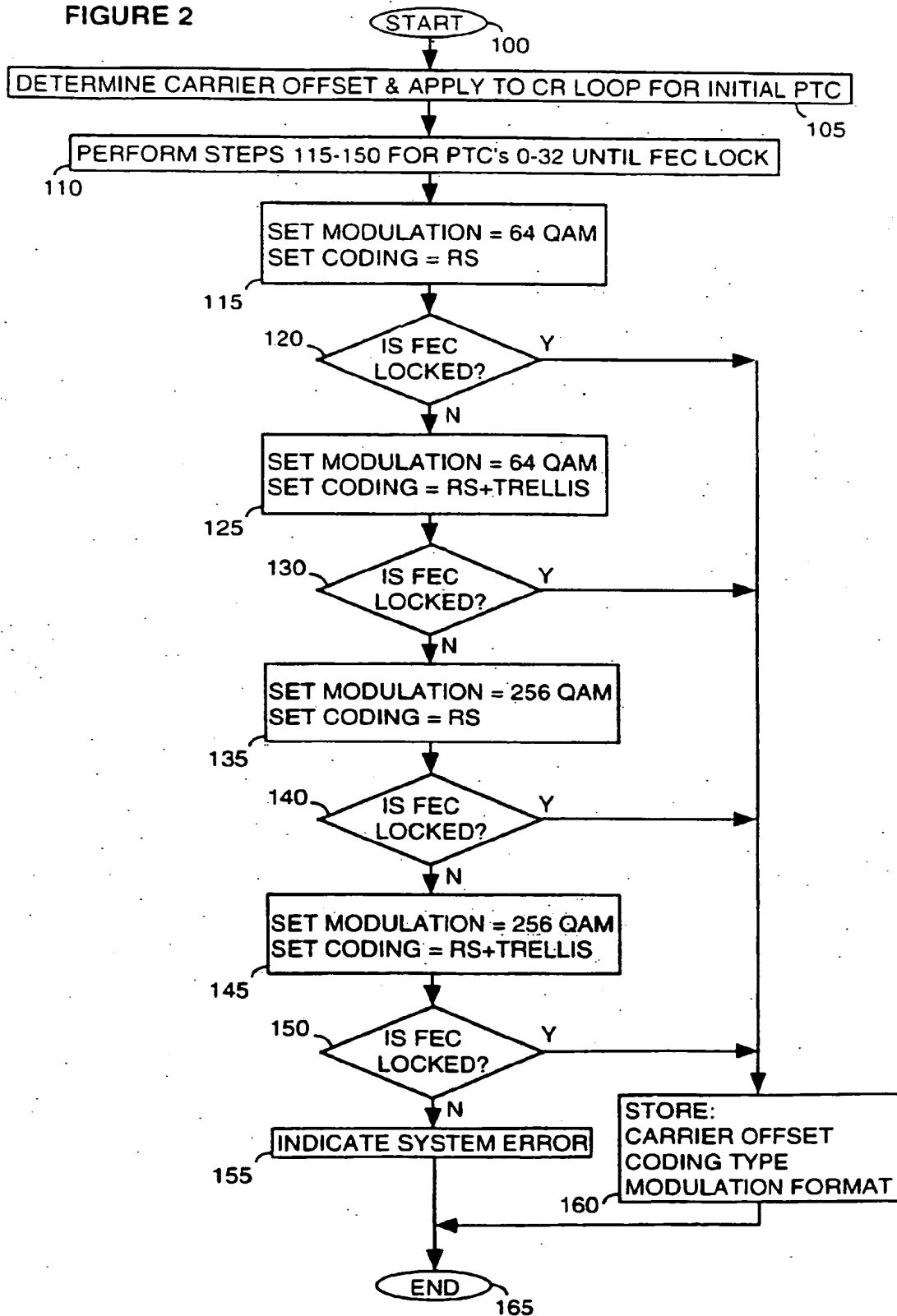


FIGURE 3

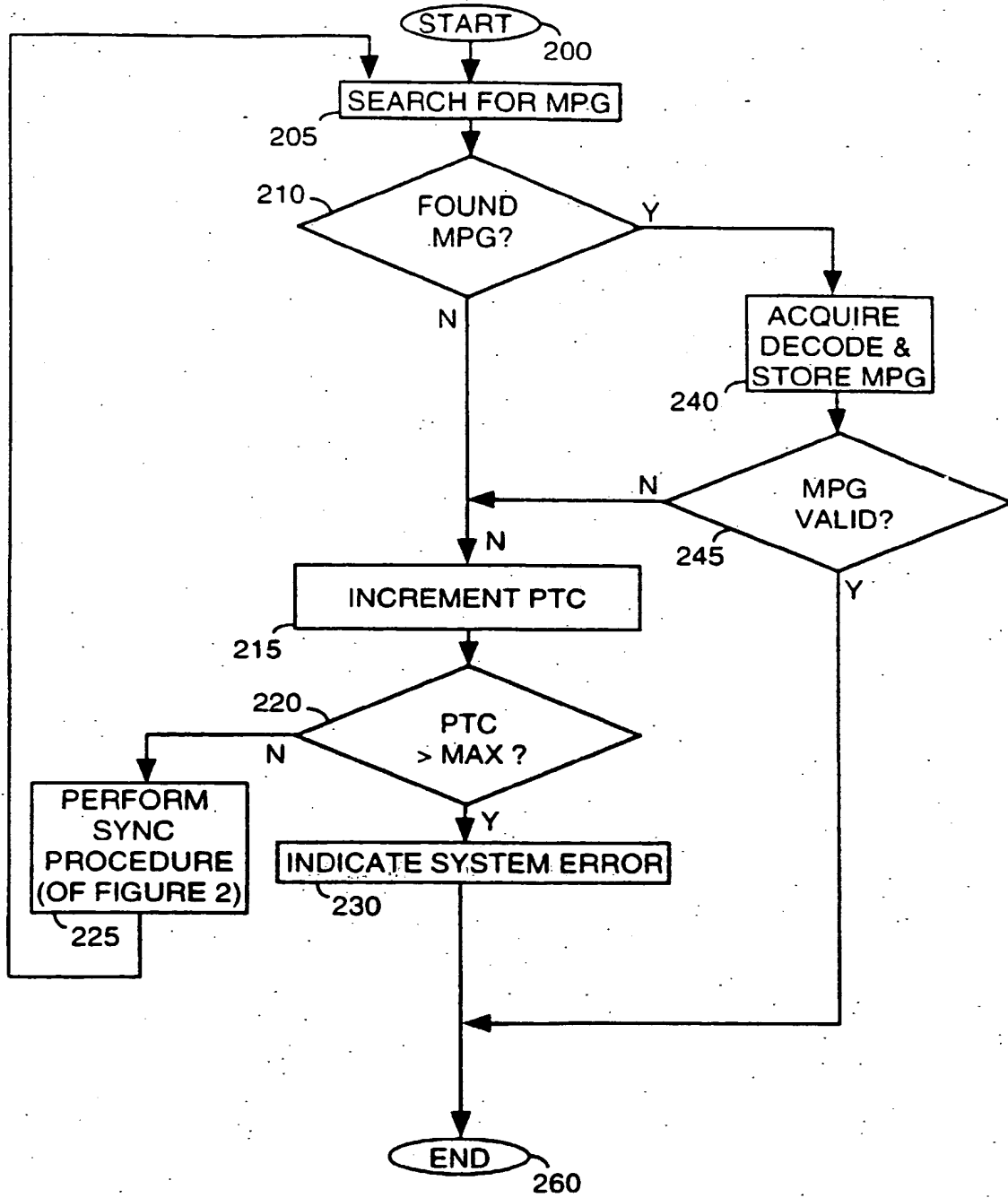


FIGURE 4

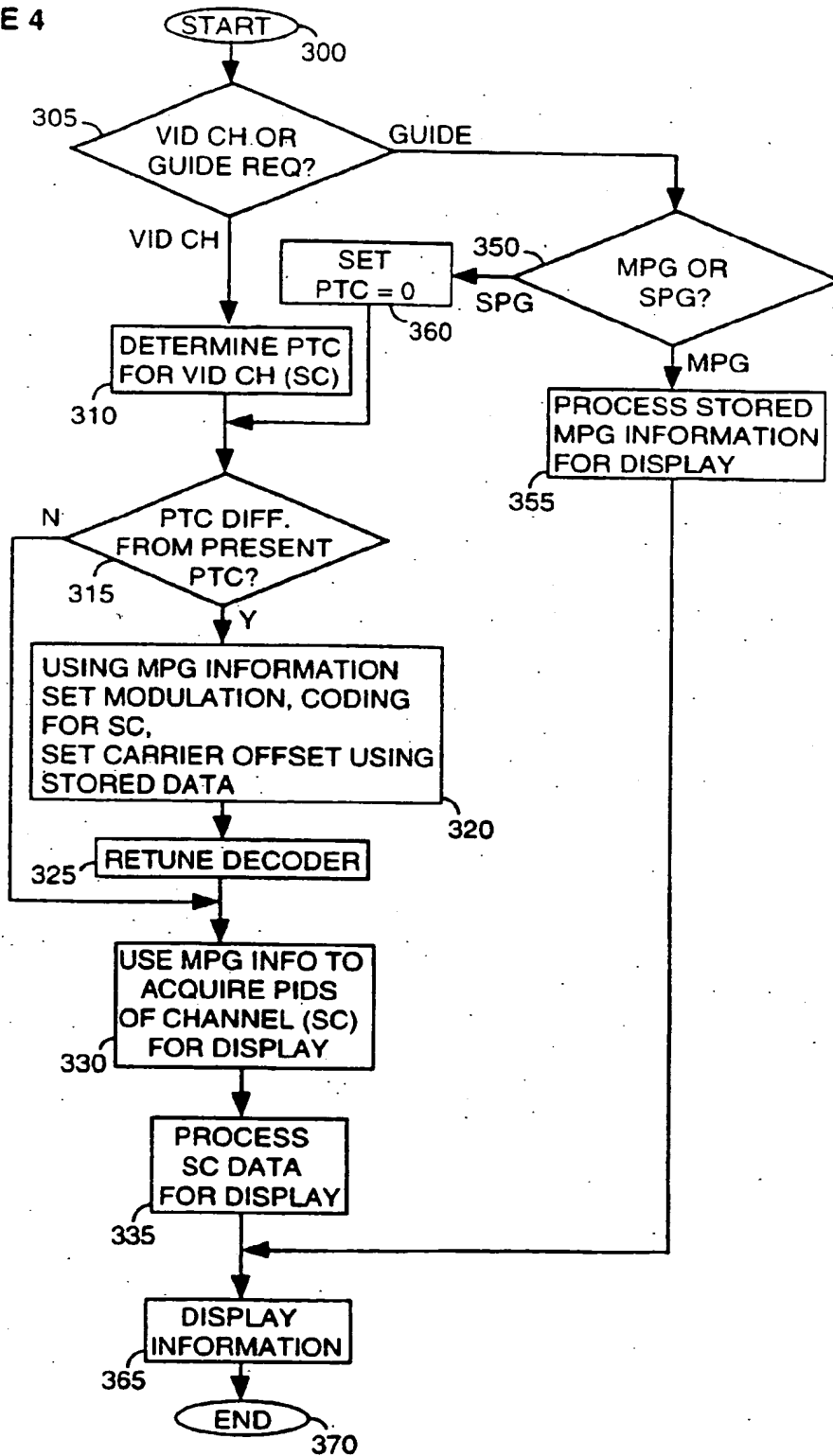
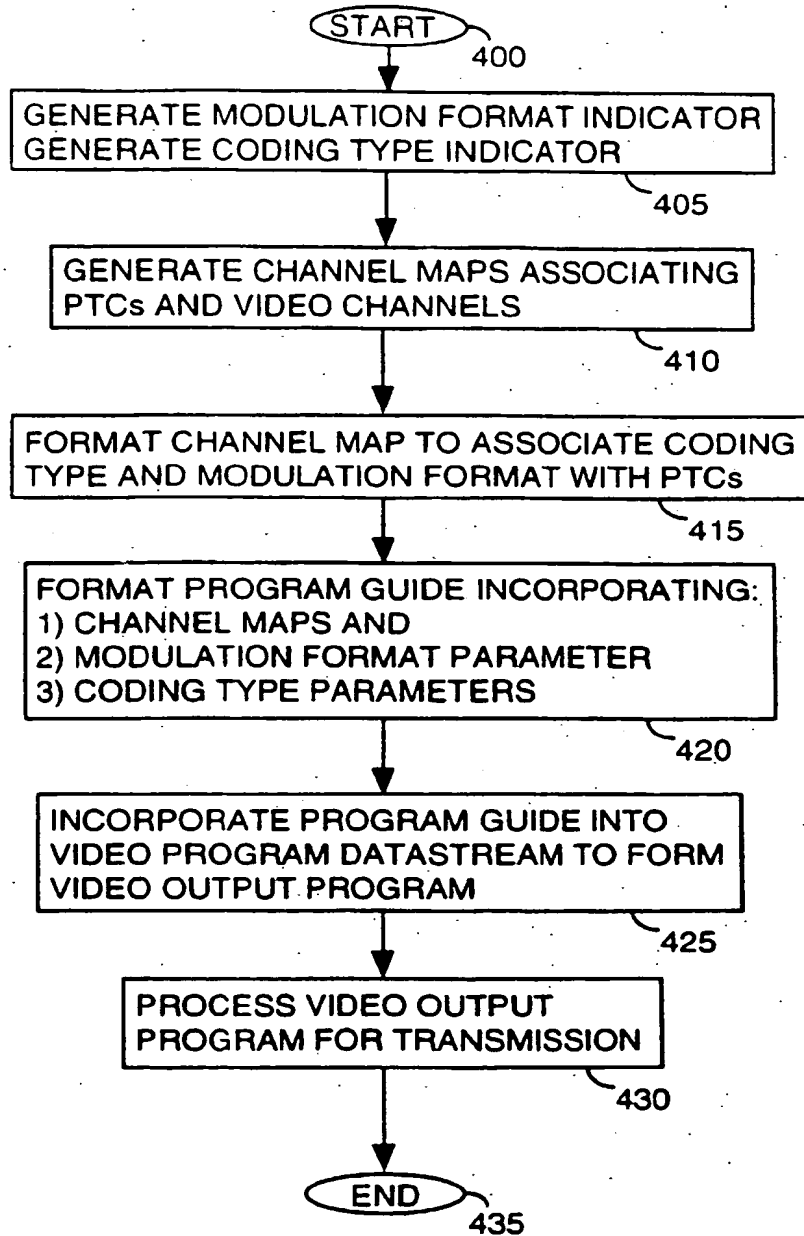


FIGURE 5



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3: 23.09.1998 Bulletin 1998/39  
 (51) Int Cl.<sup>6</sup>: H04N 5/445  
 (43) Date of publication A2: 04.02.1998 Bulletin 1998/06  
 (21) Application number: 97401804.6  
 (22) Date of filing: 28.07.1997

(84) Designated Contracting States:  
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE**  
 (30) Priority: 01.08.1996 US 24371 P  
 18.03.1997 US 818592  
 (71) Applicant: **THOMSON CONSUMER ELECTRONICS, INC.**  
 Indianapolis, IN 46206 (US)

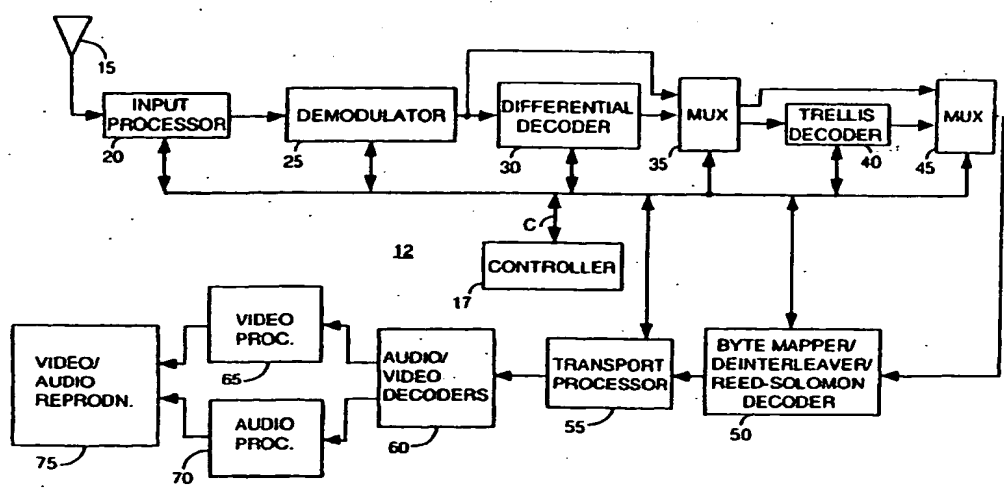
(72) Inventors:  
 • **Ozkan, Mehmet Kemal**  
 92648 Boulogne Cedex (FR)  
 • **Ramaswamy, Kumar**  
 92648 Boulogne Cedex (FR)  
 • **Stewart, John Sidney**  
 92648 Boulogne Cedex (FR)  
 (74) Representative: **Ruellan-Lemonnier, Brigitte**  
**THOMSON multimedia,**  
 46 quai A. Le Gallo  
 92648 Boulogne Cédex (FR)

(54) **A system for acquiring and processing video data and program guides transmitted in different coding formats.**

(57) A receiver system (12) automatically adaptively tunes (20) to broadcast signals that are variable in the number of channels that are transmitted, their signal coding type and their modulation format. A system receives a digital bitstream representing video information encoded in one of a plurality of different formats, and transmitted on one of a plurality of transmission channels. The system includes a processor

(17,55,20,25,30,50) for identifying and capturing program guide information including a plurality of channel maps. A channel map associates a transmission channel with a video channel output and the channel map is also associated with an encoding format. The system also includes an adaptive decoder (35,40,45) for decoding the bitstream to provide the video channel output in response to the program guide information.

**FIGURE 1.**



EP 0 822 714 A3



European Patent Office

EUROPEAN SEARCH REPORT

Application Number  
EP 97 40 1804

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (InCL6)
X	US 5 477 263 A (O'CALLAGHAN ET AL.) 19 December 1995	1,5,8,9, 14-16, 21-23, 25-27	H04N5/445
A	* column 1, line 46 - line 55 *  * column 4, line 22 - line 62 * * column 5, line 40 - line 46 * * column 6, line 57 - column 7, line 18 * * column 8, line 23 - line 63 *	2,6,7, 10-13, 17-20,24	
A	EP 0 713 337 A (THOMSON CONSUMER ELECTRONICS) 22 May 1996  * abstract * * column 1, line 57 - column 2, line 35 * * column 4, line 12 - line 44 * * claims 1-3,7,8 *	1,5,6,8, 10-12, 16-20, 26,27	
A	US 5 497 401 A (RAMASWAMY ET AL.) 5 March 1996  * column 1, line 41 - column 2, line 2 * * column 3, line 8 - line 49 *	1,5,6,8, 10-12, 16,20, 26,27	TECHNICAL FIELDS SEARCHED (InCL6)  H04N
A	WO 95 19076 A (SCIENTIFIC-ATLANTA) 13 July 1995 * page 2, line 10 - page 4, line 20 * * page 15, line 16 - page 16, line 31 *  -/--	1,8,26, 27	
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>6 August 1998</b>	Examiner <b>Berwitz, P</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone                      Y: particularly relevant if combined with another document of the same category                      A: technological background                      O: non-written disclosure                      P: intermediate document</p> <p>T: theory or principle underlying the invention                      E: earlier patent document, but published on, or after the filing date                      D: document cited in the application                      L: document cited for other reasons</p> <p>&amp;: member of the same patent family, corresponding document</p>			

EPO FORM 1503 (03.92) (P04C01)



European Patent  
Office

EUROPEAN SEARCH REPORT

Application Number  
EP 97 40 1804

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	SARGINSON P A: "MPEG-2: A TUTORIAL INTRODUCTION TO THE SYSTEMS LAYER" IEE COLLOQUIUM ON MPEG WHAT IT IS AND WHAT IT ISN'T, 1 January 1995, pages 4/1-4/13, XP000560804 * page 8, line 22 - page 10, line 14 *	1,2,5-27	
A	EP 0 624 979 A (PHILIPS ELECTRONICS) 17 November 1994 * abstract * * column 2, line 3 - column 3, line 13 *	1,5,6,8, 9,14-16, 19,21-27	
P,X	EP 0 782 332 A (SONY) 2 July 1997 * column 1, line 9 - line 41 * * column 3, line 35 - column 8, line 56 *	1,5,6, 8-12, 14-27	
P,A	EP 0 751 680 A (MATSUSHITA ELECTRIC INDUSTRIAL) 2 January 1997 * page 2, line 18 - line 44 * * page 4, line 44 - page 5, line 2 *	1,3,8, 14,15, 21-23, 26,27	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>6 August 1998</b>	Examiner <b>Berwitz, P</b>
CATEGORY OF CITED DOCUMENTS		T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document	
X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document			

EPO FORM 1503 03 82 (P04C01)